
NASA-13121 (March 2003)
NATIONAL AERONAUTICS NASA
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SECTION 13121

PRE-ENGINEERED BUILDINGS
03/03

NOTE: Delete, revise, or add to the text in this section to cover project requirements. Notes are for designer information and will not appear in the final project specification.

This section covers pre-engineered buildings and single-sheet uninsulated and insulated wall panel construction complete and erected in-place.

Aluminum doors, overhead and sliding doors, concrete, masonry, electrical, plumbing, heating and ventilating, and painting requirements, as well as cranes and hoists are not included in this section and must be specified in the appropriate sections.

Drawings must indicate building size, profile, module, column footings and foundations, roof slope, design loadings, panel-configuration insulation requirements, sidewall and roof openings, crane or monorail runway systems, type and extent of auxiliary loading, and electrical and mechanical requirements.

PART 1 GENERAL

1.1 REFERENCES

NOTE: The following references should not be manually edited except to add new references. References not used in the text will automatically be deleted from this section of the project specification.

The publications listed below form a part of this section to the extent referenced:

ALUMINUM ASSOCIATION (AA)

AA 45 (1997) Designation System for Aluminum
Finishes

AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION (AAMA)

AAMA 101 (1993) Voluntary Guide Specifications for
Aluminum and Polyvinylchloride (PVC) Prime
Windows and Sliding Glass Doors

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

AISC 317 (1992) Manual of Steel Construction,
Volume II, Connections

AMERICAN IRON AND STEEL INSTITUTE (AISI)

AISI SG-671 (1986; Addendum 1989) Specification for
the Design of Cold-Formed Steel Structural
Members

AMERICAN RAILWAY ENGINEERING AND MAINTENANCE-OF-WAY ASSOCIATION
(AREMA)

AREMA Manual (Current Until Jul 31, 1991) Manual for
Railway Engineering (Fixed Properties)

ASTM INTERNATIONAL (ASTM)

ASTM A 1 (1984) Carbon Steel Tee Rails

ASTM A 123/A 123M (2002) Standard Specification for Zinc
(Hot-Dip Galvanized) Coatings on Iron and
Steel Products

ASTM A 153/A 153M (2001a) Standard Specification for Zinc
Coating (Hot-Dip) on Iron and Steel
Hardware

ASTM A 36/A 36M (2001) Standard Specification for Carbon
Structural Steel

ASTM A 366/A 366M (1996) Standard Specification for Steel,
Sheet, Carbon, Cold-Rolled, Commercial
Quality

ASTM A 446/A 446M (1993) Standard Specification for Steel
Sheet, Zinc-Coated (Galvanized) by the
Hot-Dip Process, Structural (Physical)
Quality

ASTM A 500 (1993) Standard Specification for
Cold-Formed Welded and Seamless Carbon

	Steel Structural Tubing in Rounds and Shapes
ASTM A 501	(1993) Standard Specification for Hot-Formed Welded and Seamless Carbon-Steel Structural Tubing
ASTM A 525	(1993) Standard Specification for General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process
ASTM A 525M	(1991; Rev A) Standard Specification for General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process (Metric)
ASTM A 526/A 526M	(1990) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Commercial Quality
ASTM A 529/A 529M	(1994) Standard Specification for Structural Steel with 42 ksi (290 MPa) Minimum Yield Point - (1/2 inch (13 mm) Maximum Thickness)
ASTM A 570/A 570M	(1996) Standard Specification for Steel, Sheet and Strip, Carbon, Hot-Rolled, Structural Quality
ASTM A 572/A 572M	(1994; Rev C) Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Steels of Structural Quality
ASTM C 1036	(1991) Standard Specification for Flat Glass
ASTM C 592	(2000) Standard Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type)
ASTM C 669	(1995) Standard Specification for Glazing Compounds for Back Bedding and Face Glazing of Metal Sash
ASTM D 2135	(1983) Hard Rubbers
ASTM D 3841	(1992) Glass Fiber-Reinforced Polyester Plastic Panels
ASTM E 84	(2001) Standard Test Method for Surface Burning Characteristics of Building Materials

BUILDERS HARDWARE MANUFACTURERS ASSOCIATION (BHMA)

BHMA A156.1	(1988) Butts and Hinges
BHMA A156.18	(1987) Materials and Finishes
BHMA A156.2	(1989) Bored and Preassembled Locks and Latches
BHMA A156.3	(1994) Exit Devices
BHMA A156.4	(1992) American National Standards for Door Controls - Closers
BHMA A156.6	(1994) Architectural Door Trim
BHMA A156.8	(1994) Door Controls - Overhead Holders

DOOR AND HARDWARE INSTITUTE (DHI)

DHI A115	(1990) Steel Door Preparation Standards
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METAL BUILDING MANUFACTURERS ASSOCIATION (MBMA)

MBMA Low Rise Manual	(1986; Errata; Supple 1990) Low Rise Building Systems Manual
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STEEL DOOR INSTITUTE (SDI)

SDI 100	(1991) Standard Steel Doors and Frames
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STEEL WINDOW INSTITUTE (SWI)

SWI-01	(1989) The Specifier's Guide to Steel Windows
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1.2 GENERAL REQUIREMENTS

Manufacturer's Instructions shall be submitted by the Contracting Officer for Pre-Engineered Building Systems, indicating the recommended installation methods and sequence.

Manufacturer's Standard Color Charts and Color Panels shall be submitted by the Contracting Officer for Exterior Panels, Interior Panels, Accessories and Trim.

Design analysis and calculations for Pre-Engineered Metal Buildings, Structural Steel Members and Metal Roofing and Siding Panels shall be prepared and certified by a registered professional structural engineer.

Certificates shall be submitted for Materials, Equipment and Accessories showing conformance with the referenced standards contained in this section.

1.3 DESIGN CRITERIA

Structure shall be designed to withstand a live load on the roof, in accordance with local code requirements and wind and seismic loading and in accordance with MBMA Low Rise Manual. Loads shall be combined for determining maximum stress in accordance with MBMA Low Rise Manual.

Allowable stresses may be increased one-third for design-load combinations involving wind.

Structural steel members shall be designed in accordance with AISC 317 and AISI SG-671.

Design of pre-engineered metal buildings shall be in accordance with the MBMA Low Rise Manual.

Deflection of metal roofing and siding panels shall not exceed 1/180 of the span on single span loading under the total live and wind load.

1.4 DESIGN CRITERIA FOR CRANE LOADING

[Crane loading shall be in accordance with MBMA Low Rise Manual.]

1.5 FRAMING SYSTEM

1.5.1 Straight Column, Tapered Rafter, and Rigid Frame

Framing shall consist of straight section columns, splice plates field-bolted to tapered rafters and shall be of the span, eave height, and bay spacing.

1.5.2 Tapered Column, Straight Rafter, and Rigid Frame

Framing shall consist of tapered sections, and welded-up plate columns, both field-bolted to straight section rafters; framing shall be of the span, eave height, and bay spacing.

1.5.3 Tapered Column, Tapered Rafter, and Rigid Frame

Framing shall consist of tapered section, welded-up plate columns, and roof beams complete with splice plates for field assembly and shall be of the span, roof pitch, eave height, and bay spacing.

1.6 SUBMITTALS

NOTE: Review submittal description (SD) definitions in Section 01330, "Submittal Procedures," and edit the following list to reflect only the submittals required for the project. Submittals should be kept to the minimum required for adequate quality control. Include a columnar list of appropriate products and tests beneath each submittal description.

The following shall be submitted in accordance with Section 01330, "Submittal Procedures," in sufficient detail to show full compliance with the specification:

SD-01 Preconstruction Submittals

Manufacturer's Instructions shall be submitted in accordance with paragraph entitled, "General Requirements," of this section.

SD-02 Shop Drawings

Fabrication drawings shall be submitted for the following items:

Installation drawings shall also be submitted for the following items and shall be in accordance with the paragraph entitled, "Assembly and Erection," of this section.

Structural Steel Primary Members
Structural Steel Secondary Members
Subframing
Roofing and Siding
Accessories
Interior Panels
Windows
Steel Doors and Frames
Overhead Door Frames
Ventilators and Louvers
Gutters and Downspouts
Crane Rails
Pre-Engineered Metal Buildings

SD-03 Product Data

Manufacturer's catalog data shall be submitted for the following items, including accessories and installation materials.

Structural Steel Primary Members
Structural Steel Secondary Members
Subframing
Roofing and Siding
Coating
Accessories
Interior Panels
Insulating Materials
Windows
Steel Doors and Frames
Weatherstripping
Overhead Door Frames
Glass and Glazing
Ventilators and Louvers
Gutters and Downspouts
Crane Rails

Fluoropolymer Coating
Silicone Polyester Coating

SD-04 Samples

Contractor shall provide the following samples:

Roofing and Siding: One piece, 9 inches 230 millimeter by width of panel

Color Panels: Three pieces, 4 by 4 inches 100 by 100 millimeter , to indicate maximum color range

Exposed Fasteners: One of each type

Filler Strips: One piece, width of panel

Sandwich Walls: One piece, 8 by 11 inches 200 by 280 millimeter

Insulating Materials: One piece 8 by 11 inches 200 by 280 millimeter

One of the full-size Windows, complete with hardware, operating vent, casing, and trim. After approval, sample window shall be installed where directed and the location shall be recorded.

Manufacturer's Standard Color Charts shall be submitted in accordance with paragraph entitled, "General Requirements," of this section.

Color Panels
Exterior Panels
Interior Panels
Accessories
Trim

SD-05 Design Data

Design analysis and calculations for the following items shall be in accordance with the paragraph entitled, "General Requirements," of this section.

Pre-Engineered Metal Buildings
Structural Steel Members
Metal Roofing and Siding Panels

SD-07 Certificates

Certificates shall be submitted for the following in accordance with paragraph entitled, "General Requirements," of this section.

Materials
Equipment
Accessories

PART 2 PRODUCTS

2.1 STRUCTURAL STEEL PRIMARY MEMBERS

Steel for hot-rolled mill shapes, plates, and bars shall be in accordance with ASTM A 36/A 36M.

Hot-rolled steel sheet, plate, and strip of welded assemblies shall conform to [ASTM A 529/A 529M] [ASTM A 570/A 570M] [ASTM A 572/A 572M], Grade [42] [50].

Steel tubing shall conform to [ASTM A 501] [ASTM A 500], Grade B.

Diagonal-rod bracing steel shall be in accordance with [ASTM A 572/A 572M, Grade [60] [65]], [ASTM A 36/A 36M, not less than 3/8-inch 10 millimeter diameter]. Threads shall be rolled or cut. Nuts shall be semifinished hex-head.

Anchor bolts shall be uncoated, carbon steel in accordance with ASTM A 36/A 36M hot-dipped galvanized in accordance with ASTM A 153/A 153M.

[Primary members shall be hot-dip galvanized in accordance with ASTM A 123/A 123M.]

[Primary members shall be shop primed with a rust-inhibitive primer compatible with the finish to be applied.]

2.2 STRUCTURAL STEEL SECONDARY MEMBERS

[Members shall conform to [ASTM A 446/A 446M, Grade C] [ASTM A 570/A 570M, Grade [40] [45] [50]]. Zinc coating shall conform to ASTM A 525, G90 ASTM A 525M, Z275. Minimum thickness of members shall be 16-gage 1.6 millimeter, prepunched for bolted field assembly.]

[Members shall conform to [ASTM A 446/A 446M, Grade C] [ASTM A 570/A 570M, Grade [40] [45] [50]]. Shop prime paint shall be the final finish. Minimum thickness of members shall be 16-gage 1.6 millimeter. Members shall be prepunched for bolted field assembly.]

2.3 SUBFRAMING

[Subframing shall be die-formed shapes may be bar-size shapes in accordance with ASTM A 36/A 36M. Zinc coating shall conform to ASTM A 525, G90 ASTM A 525M, Z275. Minimum uncoated thickness shall be 18-gage 1.3 millimeter. Bar shapes shall be at least 1/4 by 1 inch 6 by 25 millimeter. T-bars shall have a minimum uncoated thickness of 22-gage 0.85 millimeter and Z-bars a minimum uncoated thickness of 14-gage 2.0 millimeter.]

[Subframing shall be die-formed shapes in accordance with ASTM A 526/A 526M, Type I, Class d, or may be bar-size shapes conforming to ASTM A 36/A 36M. Shop prime paint shall be the final finish. Minimum uncoated thickness shall be 18-gage 1.3 millimeter. Bar shapes shall be at least 1/4 by 1 inch 6 by 25 millimeter. T-bars shall have a minimum uncoated thickness of

22-gage 0.85 millimeter and Z-bars a minimum uncoated thickness of 14-gage 2.0 millimeter.]

Concealed clips shall be fabricated from hot-dip galvanized steel conforming to ASTM A 366/A 366M. Zinc coating shall be in accordance with ASTM A 525, G90 ASTM A 525M, Z275.

2.4 ROOFING AND SIDING

Panels shall conform to ASTM A 446/A 446M, Grade [A] [B] [C] [D] [E], not less than 26-gage 0.55 millimeter thick, before coating. Zinc coating shall conform to ASTM A 525, G90 ASTM A 525M, Z275.

Metal fascia shall be of the same material as the roofing and siding and not less than 26-gage 0.55 millimeter.

Roofing sheets shall be of sufficient length to bridge at least 3 purlin spans plus the required end lap. Siding sheets shall extend full height of Sandwich Walls, without horizontal joints. Roofing sheets shall extend full width from ridge to eave in buildings 60 feet 18288 millimeter and less in width. Roofing and siding sheets shall have concealed, semiconcealed, or exposed fasteners on exterior.

2.5 FINISH

[Baked enamel Coating shall be a two coat, thermosetting, acrylic enamel or vinyl-solution finish standard with the manufacturer, applied to outside of panels. Inside shall be primed.]

[Fluoropolymer Coating shall consist of a primer and a finish coat of polyvinyl fluoride, or polyvinylidene fluoride standard with the manufacturer, applied to outside of panels. Inside shall be primed.]

[Silicone Polyester Coating shall consist of an epoxy primer and a finish coat of silicone polyester standard with the manufacturer. Coating shall be applied to the outside of the panels. Inside shall be primed.]

2.6 ACCESSORIES

Sheet-metal accessories shall be formed of material of the same type and finish as roofing and siding panels and shall be not less than 26-gage 0.55 millimeter.

Filler Strips shall be premolded neoprene or polyvinylchloride.

2.7 INTERIOR PANELS

[Panels shall conform to ASTM A 446/A 446M, grade and baked-enamel finish standard with the manufacturer.]

2.8 INSULATING MATERIALS

2.8.1 Flame Spread

[Insulation shall have a flame spread not in excess of 25 and a smoke developed rating not in excess of 50 when tested in accordance with ASTM E 84.]

NOTE: Specify blanket insulation for concealed locations and exposed locations where surface waviness would not be objectionable. Board insulation must be retained as an alternative to blanket insulation and specified exclusively for exposed locations when warranted for the particular application.

2.8.2 Rigid or Semirigid Board

Board insulation shall conform to ASTM C 592. Exposed insulation shall have a white nondusting and nonshedding painted finish.

2.8.3 Blanket Insulation

Blanket insulation shall conform to ASTM C 592.

2.9 WINDOWS

NOTE: Insert Type A-A2, HS-A2, HS-A3, C-A2, C-A3, DH-A2, DH-A3, P-A2, or P-A3 in the first paragraph.

[Windows shall be aluminum and conform to AAMA 101, Type [____].] [Windows shall be factory glazed with [____] glass. Aluminum shall be provided with a AA-M10-C22-A31 clear anodized finish in accordance with the requirements of AA 45 designation system for aluminum surfaces. All ventilating sections shall be provided with insect screens.]

Windows shall be galvanized steel and shall be in accordance with SWI-01, [commercial projected] [architectural projected] [standard intermediate projected] [standard intermediate casement]. All ventilating sections shall be provided with insect screens. Windows shall be glazed with [____] glass.

2.10 STEEL DOORS AND FRAMES

Doors and frames shall conform to SDI 100.

Doors and frames shall be galvanized in accordance with ASTM A 525, G90 ASTM A 525M, Z275.

Preparation for hardware shall be in accordance with DHI A115 and the

manufacturer's standards.

2.11 FINISH HARDWARE

Hardware shall be the manufacturer's standard and conform to BHMA A156.1, BHMA A156.2, BHMA A156.3, BHMA A156.4, BHMA A156.6, and BHMA A156.8.

Finishes shall conform to BHMA A156.18.

2.12 WEATHERSTRIPPING

[Weatherstripping for the heads, jambs, meeting stiles, and sills of exterior doors shall be the manufacturer's standard.]

2.13 OVERHEAD DOOR FRAMES

Steel framing shall consist of structural-steel shapes or cold-formed members of size and details indicated, hot-dip galvanized in accordance with ASTM A 123/A 123M.

2.14 GLASS AND GLAZING

Glass shall conform to ASTM C 1036.

Glazing compound shall conform to ASTM C 669. Filler blocks shall conform to ASTM D 2135, Class G-1011.

2.15 PLASTIC GLAZING

[Plastic panels shall conform to ASTM D 3841 fire retardant.]

2.16 VENTILATORS AND LOUVERS

[Ventilators and louvers shall be the manufacturer's standard of galvanized steel conforming to ASTM A 526/A 526M. Zinc coating shall be in accordance with ASTM A 525, G90 ASTM A 525M, Z275.]

[Spring-loaded, pull-chain operated, fusible-link dampers shall be provided where indicated.]

[Bird screen shall be 1/2- by 1/2-inch 12.5 by 12.5-millimeter mesh of 0.0403-inch 1.024 millimeter diameter galvanized wire.]

2.17 GUTTERS AND DOWNSPOUTS

[Gutters and downspouts shall conform to ASTM A 526/A 526M. Zinc coating shall be in accordance with ASTM A 525, G90 ASTM A 525M, Z275. Material shall be not less than 26-gage 0.55 millimeter.]

2.18 CRANE RAILS

[Crane rails shall be controlled-cooled, open-hearth carbon steel, AREMA Manual rails conforming to ASTM A 1, No. 1 rails.]

PART 3 EXECUTION

3.1 ASSEMBLY AND ERECTION

Assembly and erection shall be on a prepared foundation in accordance with the manufacturer's instructions and recommendations.

Manufacturer shall furnish either templates or an anchor bolt layout drawing that must be used for the location of anchor bolts.

3.2 CRANE RUNWAYS

[Runways shall be erected complete with columns, girders, beams, bracing, crane rails, crane stops, and other components. Gage, alignment, and elevation of crane rails shall be accurate to a tolerance of plus or minus 1/8 inch 3 millimeter. Crane-rail joints shall be staggered with respect to each other on opposite sides of the runway and shall not coincide with the crane girder joints. Top of the crane rails shall be flush at joints.]

-- End of Section --